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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,697	09/30/2003	Rahul Gupta	12406-170001	8145
26181	7590	08/10/2006	EXAMINER	
FISH & RICHARDSON P.C. PO BOX 1022 MINNEAPOLIS, MN 55440-1022			THOMPSON, CAMIE S	
			ART UNIT	PAPER NUMBER
			1774	

DATE MAILED: 08/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/676,697

**Applicant(s)**

GUPTA ET AL.

**Examiner**

Camie S. Thompson

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on Amendment filed 5/30/06.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,7-32 is/are pending in the application.
- 4a) Of the above claim(s) 15-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,7-14 and 24-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/5/06</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. Applicant's amendment and accompanying remarks filed May 30, 2006 are acknowledged.
2. Examiner acknowledges amended claims 1-2, 4-5, 7-14 and 24-27.
3. Examiner acknowledges cancelled claims 3 and 6.
4. Examiner acknowledges newly added claims 29-32.
5. Claims 15-23 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on October 14, 2005.

### ***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-2, 4-5, 7-14 and 24-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are rendered indefinite by the thermal energy limitations. It is unclear as to whether or not the thermal energy of the layer is a constant. It is not clear if the relations between the LUMO/HOMO of a specific trap material and the thermal energy of the layer is a constant.

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Based on the specification and applicant's arguments, the numerical value for thermal energy is affected at least by temperature. Even in the case of claim 32, the thermal energy limitation is indefinite because the temperature at which the layer has a thermal energy of 0.0259 eV is not specified.

Claims 2, 4, 5, 7, 10 and 25 are further rendered indefinite by the recitation of relative terms in claims 2, 5, 10 and 25. The term "significantly" in claims 2 and 5 is a relative term.

The term "substantially" in claim 10 is a relative term.

The terms "minimized" and "sufficiently" in claim 25 are relative terms.

The terms "minimized", "sufficiently", "significantly" and "substantially" are not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim 26 is further rendered indefinite by the term "if". The term "if" implies that neither hole traps nor electron traps need be present in the emissive polymer layer. However, per claim 24, from which claim 26 depends, it is necessary to have at least one of hole or electron traps.

### ***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 1-7, 24-26, 28 and 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamazaki, U.S. Pre Grant Publication 2001/0031509.

Yamazaki discloses a light emitting device having high emission efficiency by raising re-coupling efficiency of the carriers. The light emitting device of the Yamazaki reference has an electron trap region and a hole trap region, which are formed in the emission layer. The electron trap region encloses electrons that are transferred at the lowest unoccupied molecular orbital (LUMO) within the emission layer. The hole trap region of the reference encloses holes that are transferred at the highest occupied molecular orbital (HOMO) in the emission layer. Paragraph 0044 of the reference discloses an embodiment wherein the structure has the effect of reducing the LUMO level or a structure that has the effect of raising the HOMO level in the emission layer. Paragraph 011 of the reference discloses that the light emitting device can be used as a light source. Reference claim 5 discloses that the electron trap region comprises a cluster of organic substances that form a LUMO level that is lower than the LUMO level of the emission layer. Additionally, reference claim 6 discloses that the hole trap region comprises a cluster of organic substance that form a HOMO level that is higher than the HOMO level of the emission layer. Reference claim 9 also discloses a light emitting device wherein there is a region where the LUMO level is higher than the LUMO level of the emission layer and a region wherein the HOMO level that is lower than the HOMO level in the emission layer. It is disclosed in reference claims 14 and 15 that the light emitting device comprises three emission layers wherein the electron trap region is adjacent to the first emission layer; a hole trap region is adjacent to the second emission layer and a third emission layer is adjacent to the hole trap region (energy

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barrier layers). The reference claims also disclose that the electron trap region has a LUMO level that is lower than the LUMO level of the first, second and third emission layers and the hole trap region has a HOMO level is higher than the HOMO level of the first, second and third emission layers. While Yamazaki does not explicitly disclose the thermal energy limitations of the present claims, the prior art traps, which function in the same manner required by the present claims, inherently meet these limitations.

10. Claims 1-14 and 24-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Burroughs et al., U.S. Patent Number 6,897,473.

Burroughs discloses an electroluminescent device comprising a first charge carrier injecting layer that may be a positive charge carrier transport layer which is located between the light-emissive layer and an electrode layer, or may be an anode electrode layer. Additionally, the reference discloses that the device comprises a second charge carrier injecting layer that may be a negative charge carrier transport layer which is located between the light-emissive layer and a cathode layer. Also, the reference discloses that the light emissive layer comprises first, second and third components as per instant claim 1 (see column 5, lines 1-3 and column 6, lines 58-68). Column 6, lines 30-57 of the Burroughs reference discloses that the first, second and third components each may be an organic material, suitably a polymer such as PPV or polyfluorene. Also, Burroughs discloses that alternative materials such as small molecules, Alq<sub>3</sub>, may be present in the emissive layer. Table 1 of the reference discloses HOMO and LUMO levels of various materials. Table 2 discloses the composition of the emissive layer. Figure 6 of the reference shows a band diagram for a device in which the host is F8 with the HOMO level of 5.8 and the LUMO level of 2.8, and the dopant is PFM having HOMO level of 5.0 and LUMO level

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of 2.1. Based on the relative LUMO and HOMO levels, PFM traps holes. The devices described in reference to at least Figure 9 and Figure 28 also contain a hole trap material. Figure 15 of the reference pertains to devices using F8 and F8BT. The LUMO of the F8 is 2.8 and the HOMO of the F8 is 5.8 and the LUMO of the F8BT is 3.5 and the HOMO of the F8BT is 5.9. This device provides an electron trap that is large enough to reduce electron mobility. The device described in reference to at least Figure 18 comprises hole traps and electron traps. The reference also discloses that the first component has a LUMO energy level between the LUMO energy levels of the second and third components in order to suitably assist the movement of negative charge carriers between the second and third components. Also, it disclosed in the reference that the second component has a LUMO energy level above that of the third component (see column 7, lines 55-58). Also, it is disclosed in column 7, lines 62-68 of the Burroughs reference that either or both of the first and second components are preferably materials that are emissive in the visible and/or near infrared and/or near ultraviolet regions of the spectrum.

### ***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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12. Claims 8-14, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki, U.S. Pre Grant Publication 2001/0031509 as applied to claims 1-7, 24-26, 28 and 30-32 above and further in view of Fujii et al., U.S. Patent Number 5,601,903.

Yamazaki does not explicitly disclose electron/hole traps in addition to electron traps and hole traps as required by instant claims 8-14, 27 and 29. Fujii discloses an organic EL element that comprises a pair of electrodes sandwiching an organic luminous layer and an organic carrier transport layer placed one on top of the other wherein whichever of the two, luminous layer or carrier transport layer, is placed closer to the hole injecting electrode is doped with a first organic material (see column 2, lines 45-54). Fujii discloses that when the dopants are fluorescent materials, the dopants may luminesce when trapping the electrons and holes and this occurs when the dopant to the organic hole transport layer has the maximum level of the valence band higher than that of the material forming the organic hole transport layer. Additionally, the Fujii reference discloses that the dopant to the organic luminous layer must have a minimum level of the conducting band equal to or lower than that of the materials forming the organic luminous layer to luminesce. It would be prima facie obviousness to one of ordinary skill in the art at the time of the invention to have electron/hole traps in addition to the hole traps and electron traps of the Yamazaki reference in order to satisfy the necessary conditions for the dopant to luminesce. Regarding claim 14, it would have been within the level of ordinary skill of a worker to determine suitable amounts of trap materials.



***Response to Arguments***

Applicant's arguments filed May 30, 2006 have been fully considered but they are not persuasive. Applicant argues that the Burroughs reference fails to suggest an emissive polymer layer with components where an energy barrier to trap electrons between a LUMO level of the host components and a LUMO level of the electron traps is at least a thermal energy of the layer and a second energy barrier to trap holes between a HOMO level of the host components and HOMO level of the electron traps is less than the thermal energy. The Burroughs reference discloses emissive layers comprising at least one material that functions as an electron trap or a hole trap. Burrough's Figure 15 device, for example, has a band diagram similar to that of present Figure 4, which depicts an emissive layer with an electron trap. Additionally, applicant argues that the Burroughs reference discloses a difference in HOMO levels between the F8 with F8BT is 0.1 eV. Applicant argues that the Burroughs reference discloses a difference of 0.1 eV that is at least three times greater than the thermal energy at 300K of 0.0259 eV. The recited claims do not claim a constant temperature of 300K. The Burroughs rejection is maintained.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Camie S. Thompson whose telephone number is (571) 272-1530. The examiner can normally be reached on Monday through Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena L Dye, can be reached at (571) 272-3186. The fax phone number for the Group is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



MARIE YAMNITZKY  
PRIMARY EXAMINER

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